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## SLEEVE

The present invention relates to a transport sleeve or sack which is formed by sewing up or otherwise fastening one or more webs or sheets of fabric or fibre to form a protective cover which can be wrapped around sheet material which is then fastened in the form of a bag.

5 The present invention also relates to a sleeve in the shape of a preformed bag which is formed by sewing up or otherwise fastening one or more fabric webs or sheets of synthetic material. As used herein, the term fabric means a web of woven material such as a web formed from woven polypropylene fibre. Similarly, a fibre web refers to a web woven from synthetic fibres. The variants of the invention are intended for the transportation of  
10 thin elongated materials ie sheet materials which are to be protected from damage. More particularly, the invention relates to a sleeve for transportation of articles whose edges or surfaces require protection such as kitchen work tops, doors and slate or similar objects, glass sheets and sheets of marble etc. The sleeve or sack is thus in the form of an elongated bag which protects the sides and edges of the enclosed article or in the form of a  
15 sheet that can be wrapped around the article.

Kitchen work tops, for example, are usually packaged in a thin plastics film to prevent the ingress of dust and moisture. The plastics film is usually shrunk around the work top to provide a tight fitting protective cover. Some manufacturers also include plastic or  
20 cardboard supports at the corners of the work top surface which are encased within the shrunken plastic film.

Alternatively, work tops can be provided in cardboard wrapping, usually in the form of an elongated box or in the form of two sheets of cardboard one disposed either side of the work top surface these then being held in place by strapping or tape around the outer  
25 surfaces of the cardboard and the work top.

One disadvantage with such conventional means of protecting work tops is that they do not provide adequate protection against impact. Thus, in the case of a protective plastics film

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the film does not provide any significant protection against impact by another work top or other articles or impacts which are sustained during the normal handling and transportation and storage of the work tops. Even when plastic or cardboard corner pieces are included, both the long edges and the side edges of the work top are effectively exposed to damage such as chipping. The same is true of the top and underside of the work top. Although plastics films have the advantage that they provide a degree of protection from water and moisture, plastics films are easily torn or punctured by sharp objects and thus their integrity is compromised during normal handling and storage. In the case of a cardboard sleeve, the situation is only marginally improved. Corrugated cardboard sleeving provides a slightly better degree of impact protection than a plastics film but is still easily punctured on impact with other articles. The cardboard protective sheet is easily torn and is also significantly weakened on contact with moisture or if contacted by water. Cardboard suffers the disadvantage that once wet it loses all strength.

GB 2301087 describes a transport sack which is formed by sewing up one or several fabric webs by means of edge seams in order to provide a leak-proof seam. The sack of this material is substantially square in cross-section and is intended for the transportation of pourable materials such as bulk powders. This patent is primarily concerned with providing a leak-proof seam by incorporating a sealing strip into the seam between the fabric webs so that the pourable materials do not escape from the package.

US 5437507 discloses a bag which is made by stitching opaque fabric material and is intended to provide a bag which has very high sealing tightness in the seam region.

US 4307764 discloses a bag for the transportation of bulk materials which has an open top of approximately the same cross-sectional area as the lower part of the bag. The bag is intended to be sufficiently strong to carry heavy loads of powdered or granulated material.

US 4822179 discloses semi-bulk transport bags having wide lifting members which are formed from a plural layer folded strip of plain fabric woven from flat ribbon tape. The lifting members are relatively stiff and anchored at the top of the bags and are positioned so as to distribute lifting stresses across wide segments of the side panels of the bags. The

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bags are of rectangular or circular shape and are intended for the transportation of powders and granular materials.

It is an aim of the present invention to provide an improved protective covering for articles such as work tops which are susceptible to damage. It is also an aim of the present  
5 invention that the protective cover is strong and resistant to tearing. It is a further aim that the protective cover provides a barrier to the ingress of dirt and moisture. Another aim is to provide a protective cover that does not lose strength on contact with water. It is a further aim that the protective cover is able to provide protection against impacts sustained during handling, transportation and storage. Yet another aim is to provide protective cover  
10 that is relatively cheap and easy to manufacture, and ideally can also be re-used a number of times.

It is intended that the product be as environmentally friendly as possible in the sense that it is intended to be reused so preventing disposable single trip waste packaging and avoiding UK packaging waste levies after its first trip. Even when damaged it is made from  
15 recyclable materials and thus and will be recyclable, whereas the current methods of packaging have plastic and cardboard mixtures and thus are not easily recyclable. It is a further aim that the sleeve is easy to handle in the sense that it is easy to introduce the product into the sleeve and also to retrieve the product from the sleeve. Another aim is that the article once enclosed in the sleeve, is easy to transport. The present invention  
20 satisfies some or all of the above aims.

According to one aspect of the present invention, there is provided a fibre web adapted for transporting sheet materials comprising at least three regions, each region being formed from a fibre web, wherein the regions are disposed so that a first region and a second region are each adjacent to and separated by a third region, and wherein the adjacent  
25 regions are separated by a seam, each seam being formed by fastening together the overlapping portions of two or more layers of the fibre web from adjacent regions and wherein at least one seam incorporates a filler between the overlapping layers.

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In another aspect of the present invention there is provided a sleeve formed from a web adapted to receive sheet material, wherein the sleeve is formed by fastening one or more fibre webs together by means of seams, wherein at least one seam is constructed so that a filler is provided between the fabric webs in the seam zone.

- 5 The present invention also relates to the use of a fibre web or sleeve for carrying bulky articles.

The present invention has a number of advantages over the prior art. Firstly, it is relatively easy to manufacture. Secondly, it is easy to use because the article can simply be laid on the unfolded fibre web (which is in the form of a sheet) and then enclosed or easily  
10 introduced into a bag like sleeve because of its relative rigidity. Also it aids the handling and carrying by the warehouse personnel. Thirdly, the sleeve is durable and provides considerable protection against damage to the article, and certainly more than would be the case with cardboard. Fourthly, the sleeve can be re-used a number of times which provides a further economic advantage.

- 15 The sleeve of the present invention may be constructed of a single web of fibre suitably folded and including stitched seams. Alternatively, the sleeve may be formed of more than one fibre web fastened together by seams. The seams may be formed by thermobonding or stitching, with stitched seams being preferred.

20 In one embodiment, the web forming the sleeve, whether formed from a single web of material or from more than one web stitched together, is provided in the form of a substantially flat sheet of material. This form can be described as effectively an "open form" of the sleeve and the material is substantially flat except for the occurrence of seams. The edges of the web of material may also be folded over and stitched to form a hem for added strength.

- 25 In another aspect of the present invention, there is provided a fibre web adapted for transporting sheet materials, wherein the fibre web comprises a base layer of woven fibre having three regions in which: a first protective region is adapted to cover one of the two

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largest faces of the sheet material, a second protective region is adapted to cover the other of the largest faces of the sheet material, and a third region separating the first and second regions and joined to both is adapted to cover a face separating the two largest faces of the sheet material, wherein at least the first and second protective regions include a second layer formed of plastics material bonded to the base layer, and wherein the base layer includes one or more further sealing regions adjacent to the first and or second protective regions, the or each sealing region being adapted to cover one or more of the remaining exposed sides of the sheet material when suitably folded.

In this embodiment there is no need to provide seams to separate the first, second, and third regions or the sealing region(s). Accordingly, the web representing the base layer and including the first, second, third and sealing regions may be formed of a single piece of material. However, it is possible to include seams if desired and accordingly the base layer may be formed of more than one fibre web fastened together by means of stitching or chemically bonded as desired.

In an embodiment, the or each sealing region is provided with releasable fastening means to enable the or each sealing region to be fastened releasable to a corresponding surface of the base layer when the fibre web is suitably folded. Preferably, the fastening means is a touch-contact fastening. More preferably, the fastening means is selected from Velcro, a press-stud, a buckle, or an eyelet adapted to receive corresponding retaining means.

In an other embodiment, the plastics material is corrugated plastics material. Preferably, the plastics material is corrugated polypropylene. This is a fluted material which has a high impact resistance and is very light. The material can be extruded in sheet format and cut to length. Additionally it has the advantage of being made from recycled materials. Preferably, the plastics material has a weight of 300 to 1100 gm<sup>2</sup>.

In an embodiment, the plastics material is bonded to the corresponding region of the base layer using adhesive. The adhesive is preferably polypropylene glue. However, the plastics material could be stitched or taped to the base layer.

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In another embodiment, the base layer is formed from woven synthetic fibre. Preferably the base layer is formed from woven polypropylene. More preferably, the base layer is coated and, ideally, is coated on both sides. The weight of the base layer is preferably in the range 160 to 240 gm<sup>-2</sup>. Generally, the coating will account for a further 20 to 35 gm<sup>-2</sup> of the weight of the web. The coating is preferably a polypropylene coating. The advantage of coating the material on both sides is, on the one hand, that it leads to better bonding of the protective plastics layer to the base layer and, on the other hand, it means that the outer surface of the base layer is easier to clean and does not retain dirt in the fabric weave.

The coating is applied to the woven fabric by melting the material forming the coating, usually polypropylene, and feeding the molten material through a die in semi-molten form. The coating is then brought in sheet form into the locality of the fibre web and passed through a series of chilled rollers and tensioned in accordance with procedures well known in the art. The provision of a coating on both sides may be achieved in a two stage process or may be achieved in a single process.

A number of generally applicable features are now described below which are applicable to the fibre web of the present invention whether in the form of an open sheet or closed "bag-like" container ie sleeve.

In an embodiment, one or more fabric webs or sheets of fibre or fabric are bonded together to form a bag-like container. This is effectively a "closed form" of the fibre web and is ready to receive sheet material for transportation.

In the "open form" embodiment, the article to be transported, such as work top, can be laid onto the opened form of the sleeve and then the sleeve is wrapped around the article. The corresponding edges of the sleeve can be fastened by means of releasable fastenings such as clasps, buckles or Velcro. Alternatively, the two edges of the opened sheet of material which ultimately when folded form the ends may include Velcro fastening or eyelets through which a rope, wire or ties may be passed.

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A further feature of the sleeve is that one or more of the seams includes a filler to provide the seams with a degree of shock absorbency to cushion the contents of the sleeve.

Preferably the seams include a polymeric thread or fibre such as polypropylene. The thread or fibre may be corrugated. Alternatively, or in addition, the seams may themselves  
5 be constructed so as to be corrugated. The advantage of corrugated seams and seams incorporating a filler is that additional padding is therefore provided at the very points at which damage is most likely to occur to an article ie along the edges and at the corners.

Presently, there is a 10% rejection rate for kitchen work tops when packaged using conventional plastics or cardboard protective coverings. The packaging system of the  
10 present invention substantially reduces or eliminates this rejection rate.

In another embodiment, the fabric web or sleeve is provided with one or more handles or loops to facilitate lifting and handling of the sleeve when it contains an article. The handles can be in the form of loops of material which are stitched to the fabric web.

Preferably, pairs of handles are provided at either end of the top of the sleeve or are fixed  
15 to either or both ends of the sleeve such that the sleeve can be carried by one or both ends. Thus a single web that can be lifted in both the horizontal and vertical plane may be fastened to the bottom ie the long thin side so that it provides means for carrying the sleeve which are effectively supported by the side ie the short thin side. The handle is secured at both ends of the sleeve and is threaded through a series of retaining loops, thus allowing  
20 the handle to be pulled in multiple directions to aid the carrying and handling process. In the embodiment in which a fully openable sleeve is provided, the loops are disposed such that corresponding handles are located close to either end of the sleeve once the sleeve has been folded into the closed formation.

In another embodiment, the sleeve may be in the form of a bag which has a single opening  
25 to permit introduction and removal of the article but which cannot be opened out into a single flat sheet of material. In this embodiment, the opening may be located in the top ie long edge or may be located in the side ie short edge. Preferably, the opening is in the top edge.

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In another embodiment, the polypropylene web may incorporate a region which is adapted to carry identification marks relating to the goods such as the nature and weight of the goods, safety information and handling instructions.

The sleeve of the present invention is intended for carrying articles whose length is significantly longer than its width. Typically, an article intended to be transported by the sleeve of the present invention will be at least twice as long as it is wide. The sleeve is most suited to articles which are at least 3 times longer than they are wide. Articles intended to be carried by the sleeve are substantially thinner than the width of the article, usually at least 5 times thinner than the width. The sleeve is ideally suited to transporting articles whose thickness is at least 10 times thinner than the width. The sleeve is thus most suited to carrying articles such as kitchen work tops, bedroom doors and panels, sheets of glass or marble or slate and other delicate or fragile materials whose surfaces require protection.

The web of fibre or fabric is made of a flexible material, preferably a polymer. Ideally, the polymer is a polyolefin and is preferably polypropylene or polyethylene. The polymeric material is woven into a web from polymeric fibres. Ideally, the web is coated both sides with a waterproof coating to render it impervious to water and also to enhance the resistance to the ingress of dirt and other materials. Polypropylene has the advantage that it is sufficiently strong to withstand the tensile forces that will occur when the sleeve is loaded and lifted. At the same time, the fabric should be sufficiently flexible so as to adopt the required shape but also be capable of being folded. Polypropylene is ideal for this purpose and is easily fabricated into different shapes.

Another important feature of the invention is the provision of eyelets in the polypropylene web of each of the various arrangements of the invention. The incorporation of eyelets is problematical since polypropylene may be prone to tearing because of disruption of the web once a hole has been formed for an eyelet. We have found that the weight of material is important in forming a suitable web. Ideally the weight of material should be in the range of 140 to 250 gm<sup>-2</sup>. An optimum compromise between weight and strength is obtained when the material used as the basis for forming the sleeve has a weight of



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between 175 and 225 gm<sup>2</sup>. Of course, the weight of a sleeve when in open formation may be greater than this because material is crimped or bunched together to form a seam and the seam will be formed by stitching or by adhesion of two or more layers of material. In addition, as the seam may include a filler such as a corrugated strip to provide further shock resistance along the edges of the sleeve the total weight will thus be greater.

The nature of the fabric web is also important in ensuring sufficient strength. We have found that by using a laminated, for example 2-ply, material incorporation of attachment means such as eyelets or Velcro straps which are stitched to the material can be achieved without loss of strength in the web or without risk of the web tearing. Thus, in one embodiment, the web of fibre or fabric is a laminate which is formed from two or more layers of material. Preferably both layers are polypropylene. The two or more layers are arranged such that the fibre weave or direction in one layer is substantially orthogonal to the fibre weave or direction in an adjacent layer. More than two layers could be used and the nature of the fibre need not be the same in the or each layer. Thus different layers may be formed from different materials and/or different weave patterns or thicknesses of fibres. Also, the fibre directions need not be at 90° to each other in successive layers, the important feature being that adjacent layers do not have fibres running in exactly the same direction.

In another embodiment of the invention, the closure means comprises a number of eyelets disposed along the or each open edge of the fabric. The eyelets are adapted to receive a rope, cord or clip which may be passed through a number of eyelets disposed on different sides of the enclosed article. Thus, in the case of a sleeve formerly in the open state, and which has been folded into the closed state to encompass an article, there will be eyelets present in the web at the edge of the material present on either side of the article. Ideally, the eyelets should be positioned in the corresponding edges of the fabric web so that the eyelets are aligned when the sleeve is in the closed formation. Similarly, if Velcro fastening or another type of fastening is used the corresponding portions should be aligned such that they are able to meet and ensure closure of the edge when in the folded/closed confirmation.

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In another embodiment of the present invention an attachment or lifting means comprises at least one displaceable hoop disposed near to the top edge of the fabric container. The or each hoop may be formed by folding a strip of material over and attaching both ends of the folded strip to the side of the container. The loops may be stitched or bonded chemically to the sleeve. Alternatively, the hoop could be formed by folding over the top edge of the fabric container and attaching it to the side of the container such that a hoop is formed along either part or the whole of the top edge on each side of the top edge. In either case, retaining straps hold the hoop close to the sleeve at one or more points but allow the hoop to move so that the hoop may effectively be used to lift the sleeve from different points.

We have also found that the nature of the fibre is important. Thus, if the fibre is fibulated ie a flat tape material is lightly cut or scored, irregularly, and then twisted to form the fibre then this leads to improved strength in the web, however a multifilament material can also achieve the same results.

The invention will now be described by reference to the following drawings in which:

Figure 1 illustrates one aspect of the invention in which the sleeve is in open formation;

Figure 2 illustrates in cross section the sleeve of Figure 1 when in closed formation and containing a sheet of material;

Figure 3 is an expanded view of a seam of the sleeve of Figure 1; and

Figure 4 is a side view of a sleeve according to another aspect of the invention.

Figure 5 illustrates a sleeve according to another aspect of the invention in which a fibre web is provided having protective regions.

Figure 1 shows a sleeve 1 in open formation. The sleeve comprises three regions of fabric web, a first region 2, a second region 3, and a third region 4. The first 2 and second 3 regions form the side walls of the sleeve 1 when it is in its closed form. At the edges 5, 6,

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7, 8 of the first 2 and second 3 regions are provided fastenings 9. Seams 10 are formed in the web of material so as to define regions 2, 3, 4. Seams 10 also serve to encourage the web to form a sleeve-like or bag-like confirmation when folded over an article.

Figure 2 shows in cross section the sleeve 1 of Figure 1 when in closed formation. In this view, it can be seen that the seams 10 are formed by two layers of overlapping fabric web which are fastened together. The seams are fastened together with stitching 11 and include a filler 12 to provide cushioning for the edges of the article 13 inside the bag. The top edges 14, 15 are folded over into a seam and also include a filler 12. Loops 16 of material forming lifting means are included at either end of the outside of top edges 14, 15 of the sleeve. The loops are attached by means of stitching. In an alternative embodiment (not shown) the top edges 14, 15 are folded over on themselves to form a loop and the top edges of the material are shaped so that the loop covers a part of or all of the length of top edges 14, 15 so as to provide a point for lifting.

Figure 3 shows an expanded view of a seam illustrating the formation of seam 10 from two layers of material. Seam 10 incorporates as filler 12 a shock absorbing material such as corrugated polypropylene or a fibre thread which may be made of synthetic or natural fibres. In this view the two webs forming the seam are separate in the sense that they are not formed from a single sheet.

Figure 4 shows another aspect of the invention in which the sleeve 17 is in the form of a bag having seams 18 at each edge. Loops of material 19 are provided at each end of top edges 20, 21 to allow lifting of the sleeve.

Figure 5 shows another aspect of the invention in which a transport sleeve is provided in the form of a sheet of material 22 which is formed of woven polypropylene. The woven polypropylene is coated on both sides. In the view shown, the sheet is opened out fully and laid on the ground. The sheet comprises three separate regions, a first region 23, a second region 24, and a third region 25. In first region 23 and second region 24 are provided a layer of plastics material 26 which is corrugated polypropylene. The corrugated polypropylene more or less covers the entire area of first region 23 and second

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region 24 and is bound to those respective regions by means of chemical bonding. Fold lines 28 are illustrated showing the points at which sheet 22 can be folded to wrap around a sheet of material 29 which has been placed on top of plastic layer 26 in the first region 23. In this particular view, fold lines 28 do not represent seams and are indistinguishable from adjacent parts of sheet 22 forming the base layer. The fold lines are illustrated simply to show the points at which sheet 22 may be folded and to illustrate the boundaries between first region 23, second region 24 and third region 25. Similarly, a layer of plastics material 26 is provided in second region 24 and substantially covers all of that region. Adjoining the second region 24 are provided sealing flaps 30 which may be folded along fold lines 31 once sheet 22 has been folded along fold lines 28 to cover the sheet material 29. Once the sheet material has been folded along fold lines 28, sealing flaps 30 may be folded over the outside ie the bottom side (not shown) of sheet material 22 and fastened to that by means of Velcro strips 32. A loop of material 33 is secured at its ends 34 to suitable points on the first region 23 and further retaining loops 35 through which the loop 33 may pass serve to retain loop 33.

One advantage of the fibre web or sleeve of the present invention is that it allows articles to be stacked lying on their edges side by side or allows them to be stacked one on top of another such that one enclosed article can be removed from the vicinity of another enclosed article without tearing the protective sleeve and without damaging the article enclosed.